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Patent, Trademark, and Copyright Causes

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August 30, 2000

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Date of Deposit: August 30, 2000

Honorable Commissioner of  
Patents & Trademarks  
BOX APPLICATIONS - FEE  
Washington, D.C. 20231

Re: *Patent Application for:*  
*AIRCRAFT IGNITION CABLE CONNECTOR*  
*Applicant: Howard R. Johnson*  
*Our Docket No. R061-P*

Sir:

Enclosed herewith please find the patent application, above-referenced, accompanied by a Declaration and Power of Attorney fully executed by the applicant, Howard R. Johnson, as well as an executed Statement Claiming Small Entity Status- Independent Inventor, and a check in the sum of \$345.00 representing the filing fee for a patent application filed on behalf of a small entity.

If, for any reason this fee is insufficient, please debit our Deposit Account Number 02-1731. A duplicate copy of this letter is enclosed for this purpose.

Respectfully submitted,

BEEHLER & PAVITT



David A. Belasco  
Registration No. 41,609  
Attorney for Applicant

Encl.

**STATEMENT CLAIMING SMALL ENTITY STATUS  
(37 CFR 1.9(f) & 1.27(b))--INDEPENDENT INVENTOR**

Docket Number (Optional)

R061-P

Applicant, Patentee, or Identifier: HOWARD R. JOHNSON

Application or Patent No.: \_\_\_\_\_

Filed or Issued: Filed herewithTitle: AIRCRAFT IGNITION CABLE CONNECTOR

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

☒ the specification filed herewith with title as listed above.

☐ the application identified above.

☐ the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

☒ No such person, concern, or organization exists.

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Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

HOWARD R. JOHNSON

NAME OF INVENTOR

NAME OF INVENTOR

NAME OF INVENTOR

Howard R. Johnson

Signature of inventor

Signature of inventor

Signature of inventor

Aug. 24, 2000

Date

Date

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In re Application of: )  
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BOX APPLICATIONS - FEE  
Washington, D.C. 20231

**EXPRESS MAIL CERTIFICATE**

**"Express Mail" Label number EL680358762**

**Date of Deposit: August 30, 2000**

I hereby certify that the attached paper and/or fee as identified below:

Patent Application, above-referenced, with fully executed Declaration and Power of Attorney, Verified Statement Claiming Small Entity Status, and check in the sum of \$345.00 representing filing fee and two copies of transmittal letter are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to:

Honorable Commissioner for Patents  
BOX APPLICATIONS - FEE  
Washington, D.C. 20231



Esther Miller

Dated: August 30, 2000

## Aircraft Ignition Cable Connector

### Field of Invention

The invention pertains to high voltage ignition cable connectors. More particularly, the invention relates to moisture proof connectors for spark plugs used in piston-type aircraft engines.

### Background of the Invention

Various types of high voltage ignition cable connectors have been developed for use in aircraft engines. U.S. Patent No. 4,150,865 issued to *Iliff* discloses a spark plug connector including a threaded cap through which the high-tension lead passes. The cap threadedly engages an externally threaded metal cylindrical barrel encasing the spark plug insulator and contact. A coil spring and compressible tubular grommet, held in place by the cap, serve to seal the cable end and spark plug against moisture while providing a secure contact between the cable and the contact.

U.S. Patent No. 2,109,030 issued to *Nowosielski*, is directed to an ignition apparatus and relates to spark plugs of aviation engines. The intent is to enclose all parts of the spark plug system so that high-tension current-carrying systems are protected and shielded so as to prevent interference with reception of radio signals. Insulating material covers the ignition wire with an outer metallic sheath. A swivel connection is soldered to the sheath which is detachable from a coupling nut, all of which provide the necessary protection.

U.S. Patent No. 3,334,326, issued to *Bedsore et al.* is directed to a moisture proof connector for spark plugs associated with internal combustion engines. The moisture proof connector of this reference is especially useful in aircraft type engines that are susceptible to

fouling due to the accumulation of moisture and dirt in the spark plug well. The insulated cable and grommet is a wire-meshed reinforced insulated conduit that is fastened to the upper end of the metal ferrule. The conduit, with its wire-meshed construction provides for the flexibility necessary in order to protect the cable.

5 U.S. Patent No. 4,978,309 issued to *Straub* describes an igniter cable connector that is used in the high voltage electrical systems of an aircraft engine. The patent is intended to avoid flashover between the igniter insulator and the connector insulator and is accomplished by introducing a resilient seal between the insulators. In a first embodiment of the invention, a resilient annular seal is positioned on an end of the connector insulator adjacent to and  
10 surrounding the contact. The seal engages the contact as well as the insulator end and the wall of the igniter insulator bore end section. The seal has sufficient resilience to permit insertion of the seal into the igniter insulator bore without interference with the attachment of the connector to the igniter.

15 U.S. Patent No. 2,312,757 issued to *Frei* discloses a radio shielded ignition apparatus, particularly to the connecting means for high-tension conductors in order to provide radio-shielded ignition circuits for internal combustion engines. The patent provides for the connection of the electrode with a source of high tension current by means of an insulated conductor. The conductor is shielded to prevent interference by means of a flexible metallic conduit along with a rigid metallic elbow wherein the conduit and elbow are connected  
20 together by a ferrule that telescopically receives the adjacent ends thereof.

While other variations exist, the above-described designs for aircraft ignition cable connector are typical of those encountered in the prior art. It is an objective of the present invention to provide a securely fastenable aircraft ignition cable connector that provides

superior shielding for radio-frequency signals from high voltage ignition noise. It is a further objective to provide such shielding in a connector that provides complete sealing against moisture and dirt found in the aviation environment. It is yet a further objective to provide a connector with a flexible elbow tube that may be easily formed to a variety of required configuration without the use of special tools. It is an additional objective of the invention that the flexible elbow tube be capable of retaining its shape once formed, to simplify installation after spark plug service. It is a final further objective of the invention to provide the above described capabilities in an inexpensive and durable connector which is capable of extended duty cycles.

While some of the objectives of the present invention are disclosed in the prior art, none of the inventions found include all of the requirements identified.

### Summary of the Invention

The present invention addresses all of the deficiencies of prior aircraft ignition cable connector inventions and satisfies all of the objectives described above.

An aircraft ignition cable connector of the present invention may be constructed from the following components. A radio-shielded ignition cable is provided. The cable has an outer insulating cover, a shielding conductor, an inner insulating layer, and a center conductor. A flexible, conducting, elbow tube is provided. The elbow tube has a first end and a second end and is fixedly and conductively attached at its first end to the shielding conductor of the cable. The elbow tube is capable of retaining a particular shape after bending.

A sealing sleeve is provided. The sleeve joins the outer insulating cover to the first end of the elbow tube. A threaded nut is provided. The nut has a central orifice through it, a

first end, a second end, a retaining lip at the first end and an internal thread extending from the second end toward the retaining lip. A conducting ferrule is provided. The ferrule being cylindrical in shape, having a central orifice through it, and having a body portion and a retaining portion.

5       The body portion has a first end and a second end and is sized and shaped to fit slidably through the orifice in the threaded nut. The body portion is fixedly and conductively attached at its first end to the second end of the elbow tube. The retaining portion has a first end and a second end. The first end extends from the second end of the body portion and is sized and shaped to bear rotatably against the retaining lip of the threaded nut. The second  
10       end of the retaining portion includes a cylindrical recess.

      A coil spring is provided. The coil spring has a first end and a second end. The first end is sized and shaped to rotatably engage the cylindrical recess. A cylindrical grommet is provided. The grommet has a first end, a second end, is formed of resilient, insulating material. The grommet is sized and shaped to fit slidably over the inner insulating layer of the  
15       cable. The grommet including a surrounding shoulder located between the first end and the second end. A washer is provided. The washer is sized and shaped to fit slidably over the first end of the grommet and bear against the surrounding shoulder. The coil spring is sized and shaped to surround the first end of the grommet and bear against the washer.

      A spark plug lead button is provided. The button is fixedly and conductively attached  
20       to the center conductor of the cable adjacent the second end of the grommet. A cylindrical protector cap is provided. The cap is formed of insulating material and including an inner chamber and an external thread. The thread is size and shaped to engage the internal thread of the threaded nut.

In use, the protector cap is unthreaded from the threaded nut and the cable connector is inserted into a spark plug of an aircraft engine with the spark plug lead button bearing against a central spark plug conductor. When the threaded nut is threaded onto an external thread of the spark plug, the coil spring will be compressed, causing the spark plug lead button to bear  
5 against the central spark plug conductor, thereby providing a moisture-resistant connection between the cable and the sparkplug.

In a variant of the invention, the flexible, conducting, elbow tube is formed from a sheet of malleable metallic material. The sheet has first and second, opposed parallel edges and third and fourth, opposed parallel edges normal to the first and second edges. The sheet  
10 has a series of single, back to back folds parallel to the third and fourth edges and is formed about a cylindrical mandrel with a long axis of the mandrel perpendicular to the folds. The first and second edges are joined to form an open-ended cylindrical tube.

In a further variant, the flexible, conducting, elbow tube is formed from a sheet of malleable metallic material. The sheet has first and second, opposed parallel edges and third  
15 and fourth, opposed parallel edges normal to the first and second edges. The sheet has a series of single, back to back folds parallel to the third and fourth edges. Lower portions of the folds are doubled back upon themselves so as to provide four layers of metallic material adjacent a lower surface of the sheet. The sheet is formed about a cylindrical mandrel with the lower surface outermost with a long axis of the mandrel perpendicular to the folds. The first and  
20 second edges are joined to form an open-ended cylindrical tube that has a reinforced outer surface.

Yet another variant of the invention may be constructed from the following component. A radio-shielded ignition cable is provided. The cable has an outer insulating



cover, a shielding conductor, an inner insulating layer, and a center conductor. A flexible, conducting, elbow tube is provided. The elbow tube has a first end and a second end and is fixedly and conductively attached at its first end to the shielding conductor of the cable. The elbow tube is capable of retaining a particular shape after bending.

5 A sealing sleeve is provided. The sleeve joins the outer insulating cover to the first end of the elbow tube. A threaded nut is provided. The nut has a central orifice through it, a first end, a second end, a retaining lip at the first end and an internal thread extending from the second end toward the retaining lip. A conducting ferrule is provided. The ferrule being cylindrical in shape, having a central orifice through it, and having a body portion and a  
10 retaining portion.

The body portion has a first end and a second end and is sized and shaped to fit slidably through the orifice in the threaded nut. The body portion is fixedly and conductively attached at its first end to the second end of the elbow tube. The retaining portion has a first end and a second end. The first end extends from the second end of the body portion and is  
15 sized and shaped to bear rotatably against the retaining lip of the threaded nut. The second end of the retaining portion includes a cylindrical recess.

A cylindrical grommet is provided. The grommet has a first end, a second end, is formed of resilient, insulating material. The grommet is sized and shaped to fit slidably over the inner insulating layer of the cable. The grommet includes a surrounding shoulder located  
20 adjacent to the first end. The shoulder is sized and shaped to fit frictionally within the cylindrical recess in the second end of the retaining portion of the ferrule.

A spark plug lead button is provided. The button is fixedly and conductively attached to the center conductor of the cable adjacent the second end of the grommet. A cylindrical

protector cap is provided. The cap is formed of insulating material and includes an inner chamber and an external thread. The thread is size and shaped to engage the internal thread of the threaded nut.

In use, the protector cap is unthreaded from the threaded nut and the cable connector is inserted into a spark plug of an aircraft engine with the spark plug lead button bearing against a central spark plug conductor. When the threaded nut is threaded onto an external thread of the spark plug, the spark plug lead button will bear against the central spark plug conductor, thereby providing a moisture-resistant connection between the cable and the sparkplug.

The above variant may be used with either of the above-described flexible elbow tube designs.

#### Description of the Drawings

**Figure 1** is an exploded side elevational view of the preferred embodiment of the invention including protective cap for a connector;

**Figure 2** is a plan view of a folded, metallic sheet from which a first embodiment of a flexible, conducting, elbow tube is formed;

**Figure 2a** is perspective view of the **Figure 2** embodiment being formed about a mandrel;

**Figure 2b** is a side elevation of the first embodiment of a flexible, conducting, elbow tube;

**Figure 2c** is an enlarged, cross-sectional perspective of a section of the **Figure 2b** embodiment taken along the line **2c**;

**Figure 3** is an exploded side elevational view of a second embodiment of the invention including protective cap for a connector;

**Figure 3a** is a plan view of the **Figure 3** connector and a sparkplug of the type attachable to said connector;

5        **Figure 4** is a plan view of a folded, metallic sheet from which a second embodiment of a flexible, conducting, elbow tube is formed;

**Figure 4a** is perspective view of the **Figure 4** embodiment being formed about a mandrel;

10        **Figure 4b** is a side elevation of the first embodiment of a flexible, conducting, elbow tube;

**Figure 4c** is an enlarged, cross-sectional perspective of a section of the **Figure 4b** embodiment taken along the line **4c**.

#### Detailed Description of the Preferred Embodiment

15        **Figure 1** illustrates an aircraft ignition cable connector **10** of the present invention that may be constructed from the following components. A radio-shielded ignition cable **14** is provided. The cable **14** has an outer insulating cover **18**, a shielding conductor **22**, an inner insulating layer **26**, and a center conductor **30**. A flexible, conducting, elbow tube **34** is provided. The elbow tube **34** has a first end **38** and a second end **42** and is fixedly and  
20        conductively attached at its first end **38** to the shielding conductor **22** of the cable **14**. The elbow tube **34** is capable of retaining a particular shape after bending.

A sealing sleeve **46** is provided. The sleeve **46** joins the outer insulating cover **18** to the first end **38** of the elbow tube **34**. A threaded nut **50** is provided. The nut **50** has a central

orifice **54** through it, a first end **58** , a second end **62**, a retaining lip **66** at the first end **58** and an internal thread **70** extending from the second end **62** toward the retaining lip **66**. A conducting ferrule **74** is provided. The ferrule **74** being cylindrical in shape, having a central orifice **78** through it, and having a body portion **82** and a retaining portion **86**.

5       The body portion **82** has a first end **88** and a second end **90** and is sized and shaped to fit slidably through the orifice **54** in the threaded nut **50**. The body portion **82** is fixedly and conductively attached at its first end **88** to the second end **42** of the elbow tube **34**. The retaining portion **86** has a first end **94** and a second end **98**. The first end **94** extends from the second end **90** of the body portion **82** and is sized and shaped to bear rotatably against the  
10 retaining lip **66** of the threaded nut **50**. The second end **98** of the retaining portion **86** includes a cylindrical recess **102**.

A coil spring **106** is provided. The coil spring **106** has a first end **110** and a second end **114**. The first end **110** is sized and shaped to rotatably engage the cylindrical recess **102**. A cylindrical grommet **118** is provided. The grommet **118** has a first end **122**, a second end  
15 **126**, is formed of resilient, insulating material. The grommet **118** is sized and shaped to fit slidably over the inner insulating layer **26** of the cable **14**. The grommet **118** including a surrounding shoulder **130** located between the first end **122** and the second end **126**. A washer **134** is provided. The washer **134** is sized and shaped to fit slidably over the first end  
20 **122** of the grommet **118** and bear against the surrounding shoulder **130**. The coil spring **106** is sized and shaped to surround the first end **122** of the grommet **118** and bear against the washer **134**.

A spark plug lead button **138** is provided. The button **138** is fixedly and conductively attached to the center conductor **30** of the cable **14** adjacent the second end **126** of the

grommet **118**. A cylindrical protector cap **142** is provided. The cap **142** is formed of insulating material and including an inner chamber **146** and an external thread **150**. The thread **150** is size and shaped to engage the internal thread **70** of the threaded nut **50**.

In use, the protector cap **142** is unthreaded from the threaded nut **50** and the cable  
5 connector **10** is inserted into a spark plug (not shown) of an aircraft engine (not shown) with the spark plug lead button **138** bearing against a central spark plug conductor (not shown). When the threaded nut **50** is threaded onto an external thread (not shown) of the spark plug, the coil spring **106** will be compressed, causing the spark plug lead button **138** to bear against the central spark plug conductor, thereby providing a moisture-resistant connection between  
10 the cable **14** and the sparkplug.

In a variant of the invention, as illustrated in **Figures 2, 2a, 2b and 2c**, the flexible, conducting, elbow tube **34** is formed from a sheet **146** of malleable metallic material. As shown in **Figure 2**, the sheet **146** has first **150** and second **154**, opposed parallel edges and third **158** and fourth **162**, opposed parallel edges normal to the first **150** and second **154** edges.  
15 As shown in **Figure 2c**, the sheet **146** has a series of single, back-to-back folds **166** parallel to the third **154** and fourth **158** edges and is formed about a cylindrical mandrel **170** with a long axis **174** of the mandrel **170** perpendicular to the folds **166**, as illustrated in **Figure 2a**. As illustrated in **Figure 2b**, the first **150** and second **154** edges are joined to form an open-ended cylindrical tube **178**.

20 In a further variant, as illustrated in **Figures 4, 4a, 4b and 4c**, the flexible, conducting, elbow tube **34** is formed from a sheet **182** of malleable metallic material. As shown in **Figure 4**, the sheet **182** has first **186** and second **190**, opposed parallel edges and third **194** and fourth

198, opposed parallel edges normal to the first 186 and second 190 edges. As shown in Figure 4c, the sheet 182 has a series of single, back to back folds 202 parallel to the third 194 and fourth 198 edges. Lower portions 206 of the folds 202 are doubled back upon themselves so as to provide four layers 210 of metallic material adjacent a lower surface 214 of the sheet 182. The sheet 182 is formed about a cylindrical mandrel 218 with the lower surface 214 outermost with a long axis 222 of the mandrel 218 perpendicular to the folds 202 as illustrated in Figure 4a. As illustrated in Figure 4b, the first 186 and second 190 edges are joined to form an open-ended cylindrical tube 226 that has a reinforced outer surface 230.

As illustrated in Figures 3 and 3a, yet another variant of the invention may be constructed from the following component. A radio-shielded ignition cable 234 is provided. The cable 234 has an outer insulating cover 238, a shielding conductor 242, an inner insulating layer 246, and a center conductor 250. A flexible, conducting, elbow tube 254 is provided. The elbow tube 254 has a first end 258 and a second end 262 and is fixedly and conductively attached at its first end 258 to the shielding conductor 242 of the cable 234. The elbow tube 254 is capable of retaining a particular shape after bending.

A sealing sleeve 260 is provided. The sleeve 260 joins the outer insulating cover 238 to the first end 258 of the elbow tube 254. A threaded nut 266 is provided. The nut 266 has a central orifice 270 through it, a first end 274, a second end 278, a retaining lip 282 at the first end 274 and an internal thread 286 extending from the second end 278 toward the retaining lip 282. A conducting ferrule 288 is provided. The ferrule 288 being cylindrical in shape, having a central orifice 290 through it, and having a body portion 294 and a retaining portion 298.

The body portion 294 has a first end 302 and a second end 306 and is sized and shaped to fit slidably through the orifice 270 in the threaded nut 266. The body portion 294 is fixedly

and conductively attached at its first end **302** to the second end **262** of the elbow tube **254**.

The retaining portion **298** has a first end **310** and a second end **314**. The first end **310** extends from the second end **306** of the body portion **294** and is sized and shaped to bear rotatably against the retaining lip **282** of the threaded nut **266**. The second end **314** of the retaining  
5 portion **298** includes a cylindrical recess **318**.

A cylindrical grommet **322** is provided. The grommet **322** has a first end **326**, a second end **330**, is formed of resilient, insulating material. The grommet **322** is sized and shaped to fit slidably over the inner insulating layer **246** of the cable **234**. The grommet **322** includes a surrounding shoulder **328** located adjacent to the first end **326**. The shoulder **328** is  
10 sized and shaped to fit frictionally within the cylindrical recess **318** in the second end **314** of the retaining portion **298** of the ferrule **288**.

A spark plug lead button **334** is provided. The button **334** is fixedly and conductively attached to the center conductor **250** of the cable **234** adjacent the second end **330** of the grommet **322**. A cylindrical protector cap **254** is provided. The cap **254** is formed of  
15 insulating material and includes an inner chamber **258** and an external thread **262**. The thread **266** is size and shaped to engage the internal thread **286** of the threaded nut **266**.

In use, the protector cap **254** is unthreaded from the threaded nut **266** and the cable connector **10** is inserted into a spark plug **340** of an aircraft engine (not shown) with the spark plug lead button **334** bearing against a central spark plug conductor (not shown). When the  
20 threaded nut **266** is threaded onto an external thread (not shown) of the spark plug, the spark plug lead button **334** will bear against the central spark plug conductor, thereby providing a moisture-resistant connection between the cable **234** and the sparkplug **340**.

The above variant may be used with either of the above-described flexible elbow tube 34, 254 designs. The aircraft ignition cable connector mechanism 10 has been described with reference to particular embodiments. Other modifications and enhancements can be made without departing from the spirit and scope of the claims that follow.

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## CLAIMS

## 1. An aircraft ignition cable connector, comprising:

a radio-shielded ignition cable, said cable having an outer insulating cover, a shielding conductor, an inner insulating layer, and a center conductor;

5 a flexible, conducting, elbow tube, said elbow tube having a first end and a second end and being fixedly and conductively attached at its first end to the shielding conductor of said cable;

said elbow tube being capable of retaining a particular shape after bending;

10 a sealing sleeve, said sleeve joining said outer insulating cover to the first end of said elbow tube;

a threaded nut, said nut having a central orifice therethrough, a first end, a second end, a retaining lip at said first end and an internal thread extending from said second end toward said retaining lip;

15 a conducting ferrule, said ferrule being cylindrical in shape, having a central orifice therethrough, and having a body portion and a retaining portion;

said body portion having a first end and a second end and being sized and shaped to fit slidably through the orifice in the threaded nut and being fixedly and conductively attached at its first end to the second end of the elbow tube;

20 said retaining portion having a first end and a second end, said first end extending from the second end of the body portion and being sized and shaped to bear rotatably against the retaining lip of the threaded nut;

said second end of said retaining portion including a cylindrical recess;

a coil spring, said coil spring having a first end and a second end, said first end being sized and shaped to rotatably engage said cylindrical recess;

a cylindrical grommet, said grommet having a first end, a second end, being formed of resilient, insulating material and being sized and shaped to fit slidably over the inner insulating layer of the cable, said grommet including a surrounding shoulder disposed between said first end and said second end;

a washer, said washer being sized and shaped to fit slidably over the first end of the grommet and bear against said surrounding shoulder;

said coil spring being sized and shaped to surround the first end of the grommet and bear against the washer;

a spark plug lead button, said button being fixedly and conductively attached to the center conductor of the cable adjacent the second end of the grommet;

a cylindrical protector cap, said cap formed of insulating material and including an inner chamber and an external thread, said thread being size and shaped to engage the internal thread of the threaded nut; and

whereby, when the protector cap is unthreaded from the threaded nut and the cable connector is inserted into a spark plug of an aircraft engine with the spark plug lead button bearing against a central spark plug conductor and when the threaded nut is threaded onto an external thread of the spark plug, the coil spring will be compressed, causing the spark plug lead button to bear against the central spark plug conductor,

thereby providing a moisture-resistant connection between the cable and the sparkplug.

2. An aircraft ignition cable connector as described in Claim 1 wherein the flexible,  
conducting, elbow tube is formed from a sheet of malleable metallic material, said  
sheet having first and second, opposed parallel edges and third and fourth, opposed  
parallel edges normal to said first and second edges, a series of single, back to back  
folds parallel to said third and fourth edges, said sheet being formed about a cylindrical  
mandrel, a long axis of said mandrel being perpendicular to said folds, said first and  
second edges being joined to form an open-ended cylindrical tube.
3. An aircraft ignition cable connector as described in Claim 1 wherein the flexible,  
conducting, elbow tube is formed from a sheet of malleable metallic material, said  
sheet having first and second, opposed parallel edges and third and fourth, opposed  
parallel edges normal to said first and second edges, a series of single, back to back  
folds parallel to said third and fourth edges, lower portions of said folds being doubled  
back upon themselves so as to provide four layers of metallic material adjacent a lower  
surface of said sheet, said sheet being formed about a cylindrical mandrel with said  
lower surface outermost, a long axis of said mandrel being perpendicular to said folds,  
said first and second edges being joined to form an open-ended cylindrical tube having  
a reinforced outer surface.

4. An aircraft ignition cable connector, comprising:

a radio-shielded ignition cable, said cable having an outer insulating cover, a

shielding conductor, an inner insulating layer, and a center conductor;

a flexible, conducting, elbow tube, said tube having a first end and a second

end and being fixedly and conductively attached at its first end to the

shielding conductor of said cable;

said elbow tube being capable of retaining a particular shape after bending;

a sealing sleeve, said sleeve joining said outer insulating cover to the first end

of said elbow tube;

a threaded nut, said nut having a central orifice therethrough, a first end, a

second end, a retaining lip at said first end and an internal thread

extending from said second end toward said retaining lip;

a conducting ferrule, said ferrule being cylindrical in shape, having a central

orifice therethrough, and having a body portion and a retaining portion;

said body portion having a first end and a second end and being sized and

shaped to fit slidably through the orifice in the threaded nut and being

fixedly and conductively attached at its first end to the second end of

the elbow tube;

said retaining portion having a first end and a second end, said first end

extending from the second end of the body portion and being sized and

shaped to bear rotatably against the retaining lip of the threaded nut;

said second end of said retaining portion including a cylindrical recess;

a cylindrical grommet, said grommet having a first end, a second end, being  
formed of resilient, insulating material and being sized and shaped to fit  
slidably over the inner insulating layer of the cable, said grommet  
including a surrounding shoulder disposed adjacent said first end, said  
5 shoulder sized and shaped to fit frictionally within the cylindrical recess  
in the second end of the retaining portion of the ferrule;

a spark plug lead button, said button being fixedly and conductively attached to  
the center conductor of the cable adjacent the second end of the  
grommet;

10 a cylindrical protector cap, said cap formed of insulating material and including  
an inner chamber and an external thread, said thread being size and  
shaped to engage the internal thread of the threaded nut; and

15 whereby, when the protector cap is unthreaded from the threaded nut and the  
cable connector is inserted into a spark plug of an aircraft engine with  
the spark plug lead button bearing against a central spark plug  
conductor and when the threaded nut is threaded onto an external thread  
of the spark plug, the spark plug lead button will bear against the  
central spark plug conductor, thereby providing a moisture-resistant  
connection between the cable and the sparkplug.

- 20
5. An aircraft ignition cable connector as described in Claim 4 wherein the flexible,  
conducting, elbow tube is formed from a sheet of malleable metallic material, said  
sheet having first and second, opposed parallel edges and third and fourth, opposed

parallel edges normal to said first and second edges, a series of single, back to back folds parallel to said third and fourth edges, said sheet being formed about a cylindrical mandrel, a long axis of said mandrel being perpendicular to said folds, said first and second edges being joined to form an open-ended cylindrical tube.

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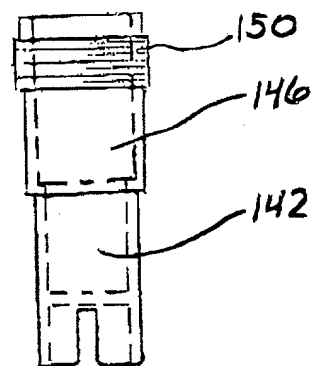
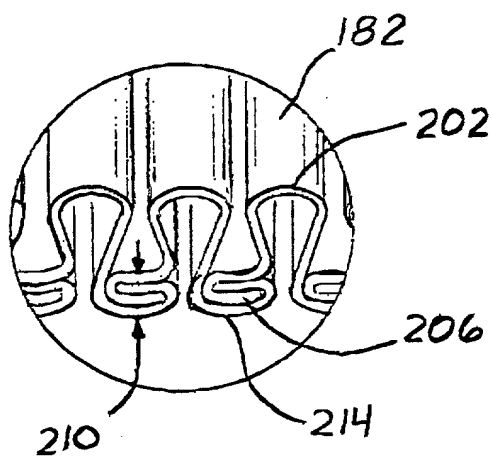
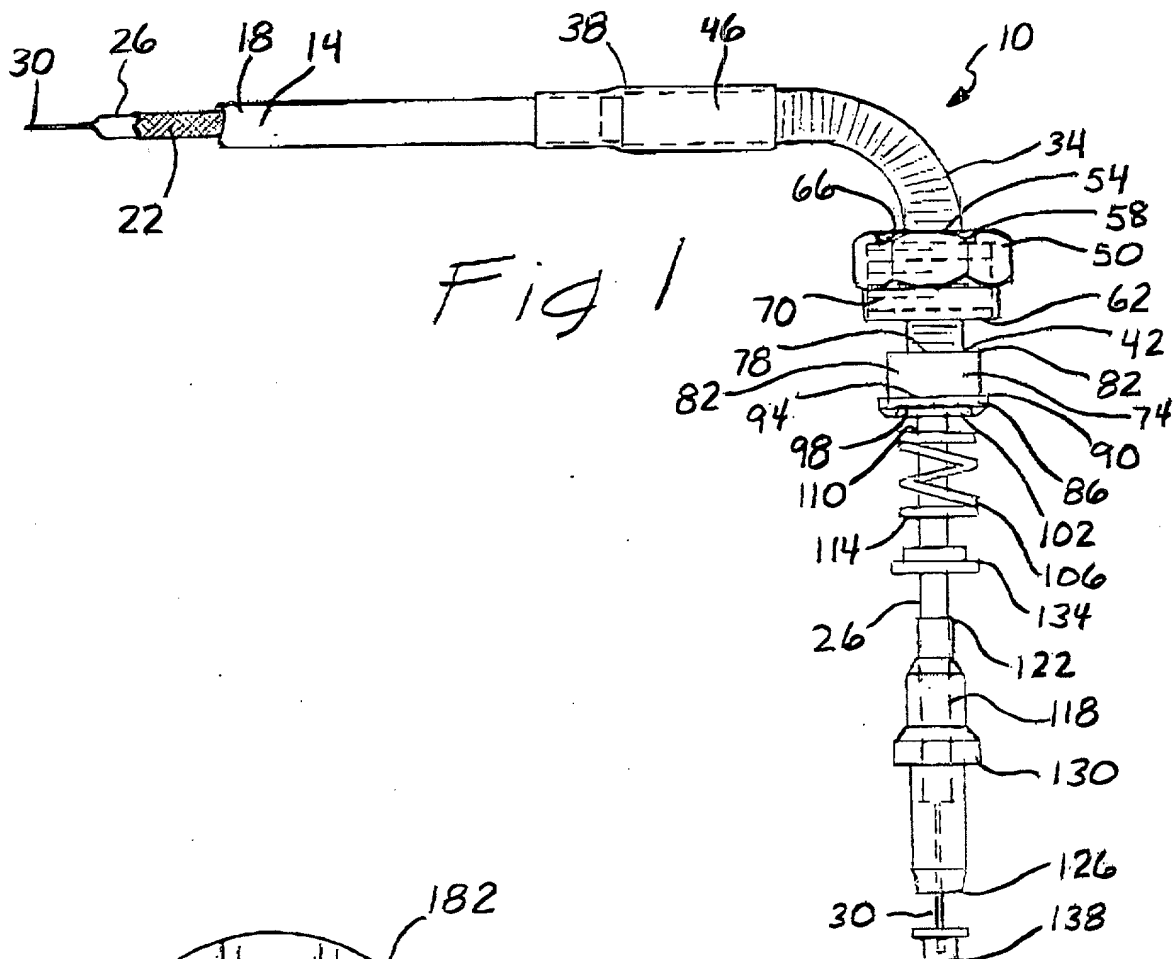
6. An aircraft ignition cable connector as described in Claim 4 wherein the flexible, conducting, elbow tube is formed from a sheet of malleable metallic material, said sheet having first and second, opposed parallel edges and third and fourth, opposed parallel edges normal to said first and second edges, a series of single, back to back folds parallel to said third and fourth edges, lower portions of said folds being doubled back upon themselves so as to provide four layers of metallic material adjacent a lower surface of said sheet, said sheet being formed about a cylindrical mandrel with said lower surface outermost, a long axis of said mandrel being perpendicular to said folds, said first and second edges being joined to form an open-ended cylindrical tube having a reinforced outer surface.

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## ABSTRACT

An aircraft ignition cable connector includes a radio-shielded ignition cable. The cable has an outer insulating cover, a shielding conductor, an inner insulating layer, and a center conductor. The cable is encased in a flexible, conducting, elbow tube. The elbow tube is attached at one end to the shielding conductor of the cable and attached at the other end to a metallic ferrule held to a threaded spark plug by an internally threaded nut. The elbow tube is capable of retaining a particular shape after bending. The elbow tube is formed from a sheet of malleable metallic material. The sheet has first and second, opposed parallel edges and third and fourth, opposed parallel edges normal to the first and second edges. The sheet has a series of single, back-to-back folds parallel to the third and fourth edges and is formed about a cylindrical mandrel with the long axis of the mandrel perpendicular to the folds. The first and second edges are joined to form an open-ended cylindrical tube that is shaped into the elbow. In a variant of the invention, lower portions of the back-to-back folds are doubled back upon themselves so as to provide four layers of metallic material adjacent the lower surface of the sheet. The sheet is formed about a cylindrical mandrel with the lower surface outermost with the long axis of the mandrel perpendicular to the folds. The first and second edges are joined to form an open-ended cylindrical tube that has a reinforced outer surface.





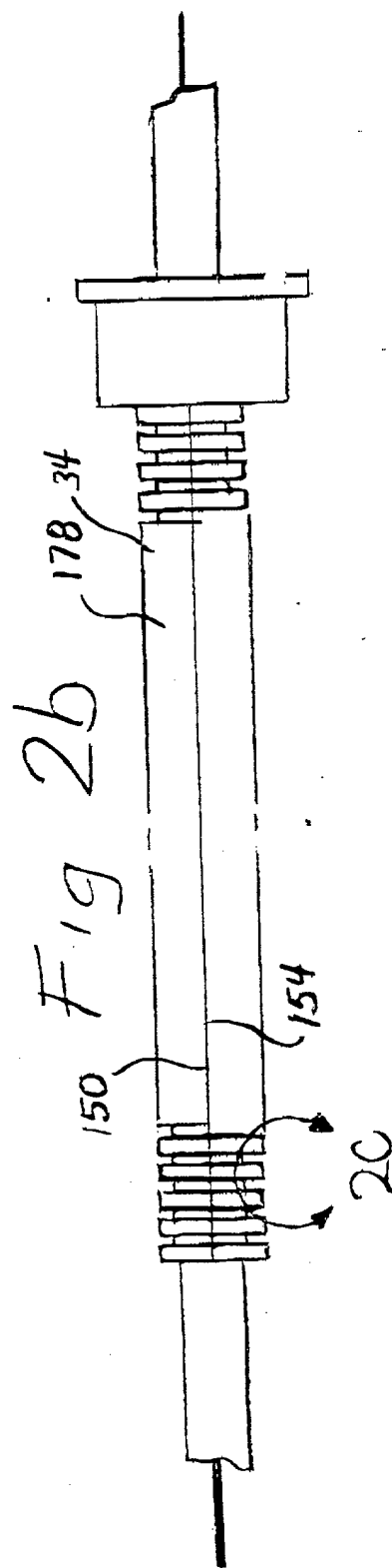
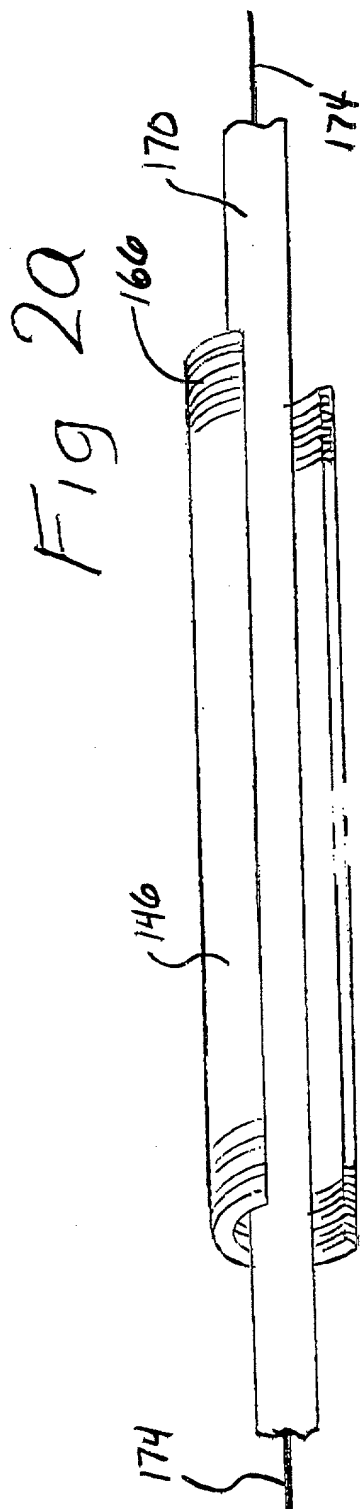
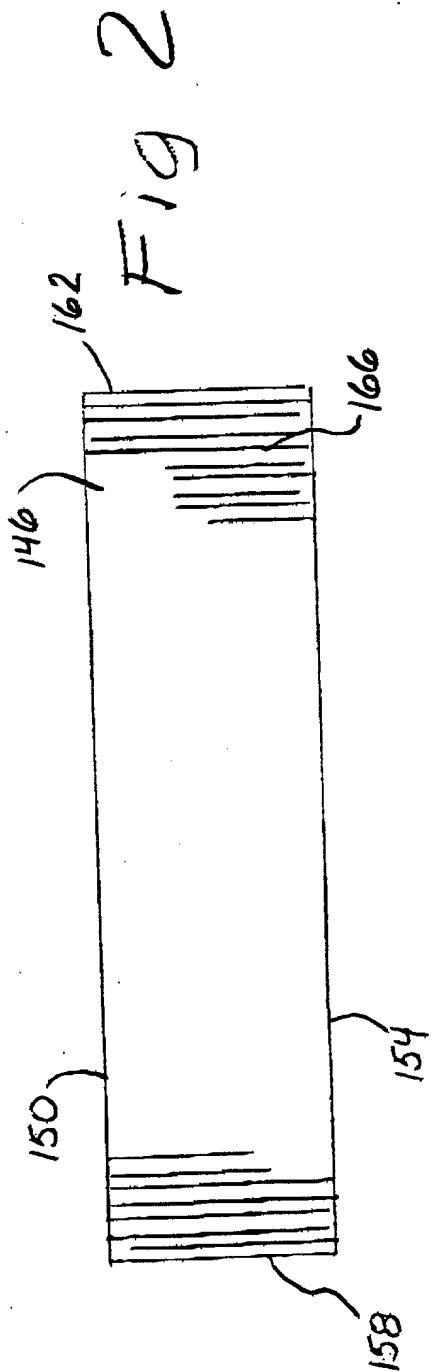


Fig 3

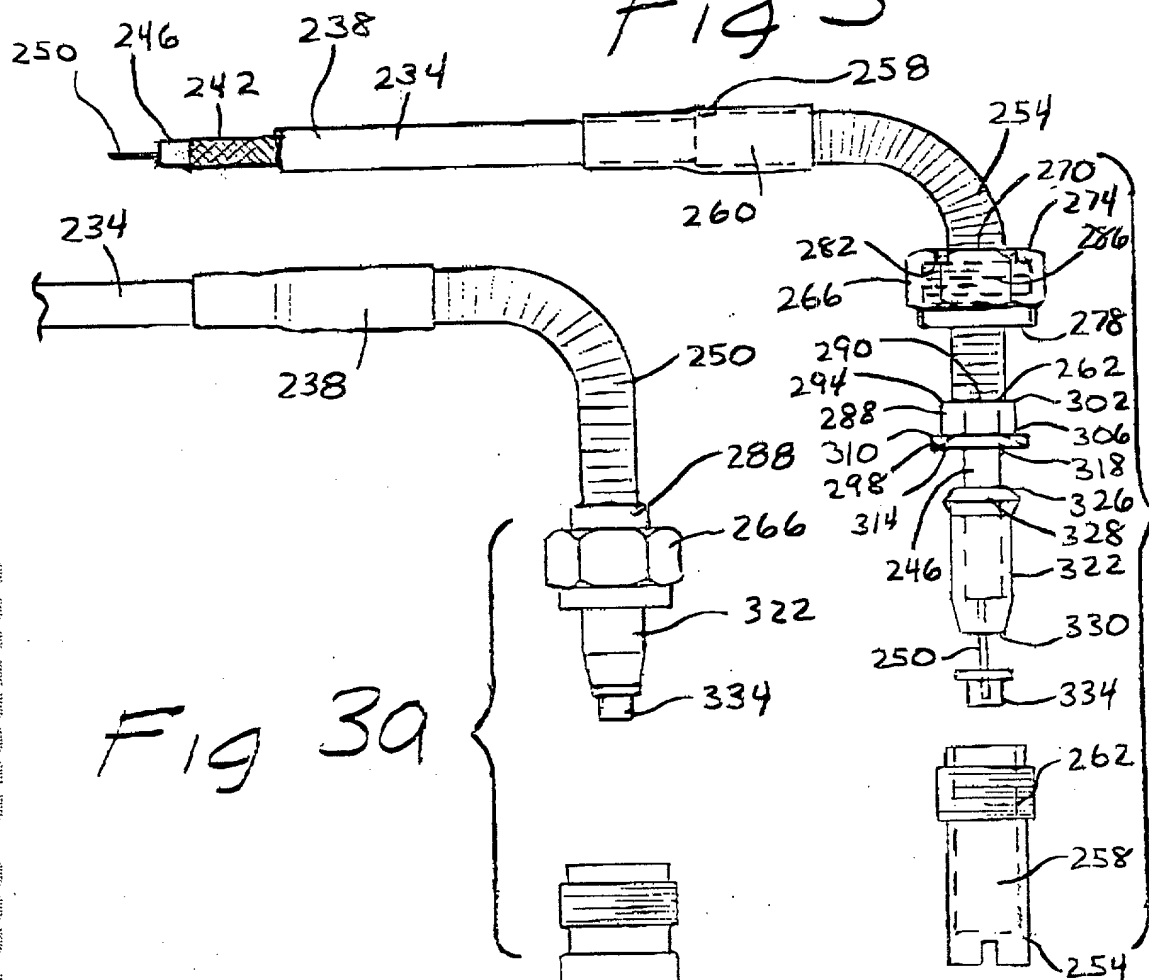


Fig 3a

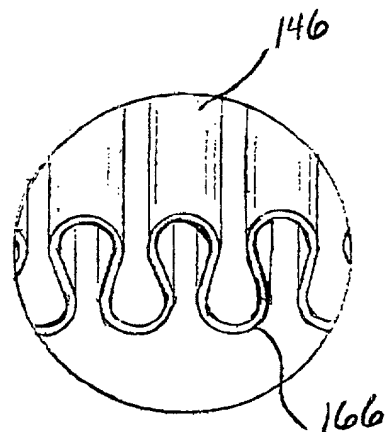
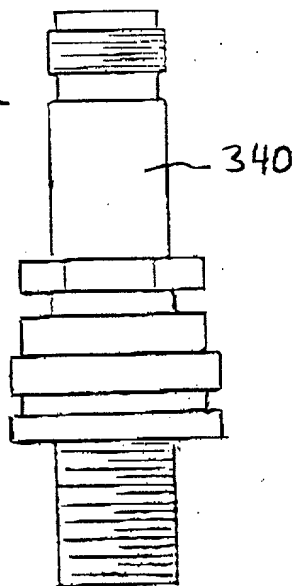
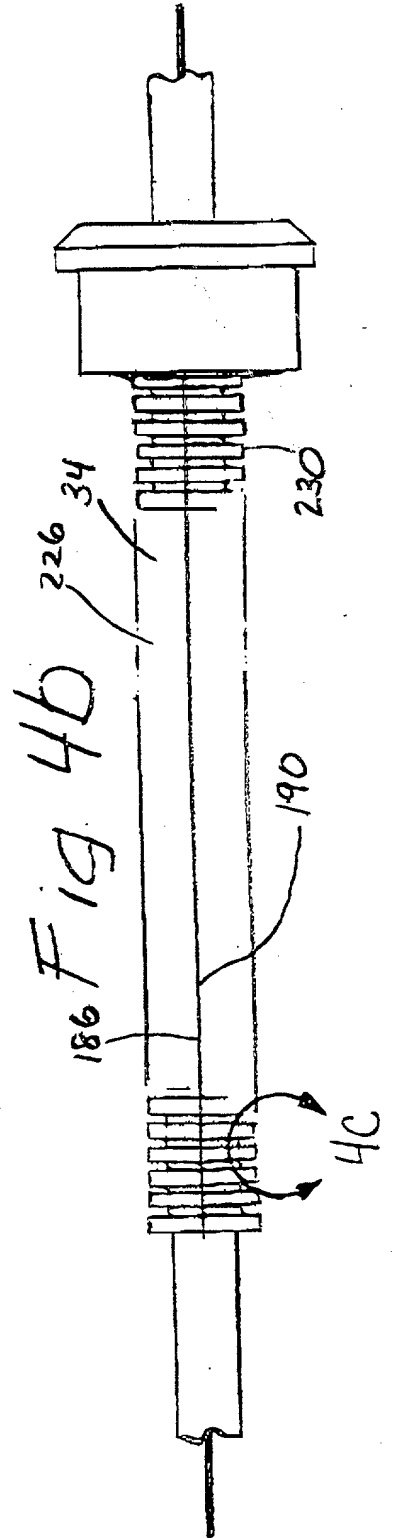
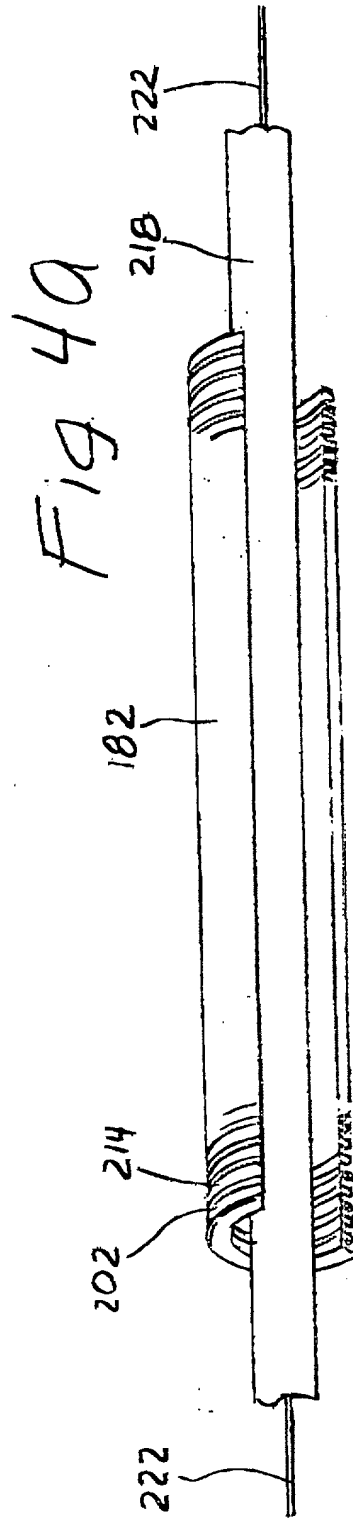
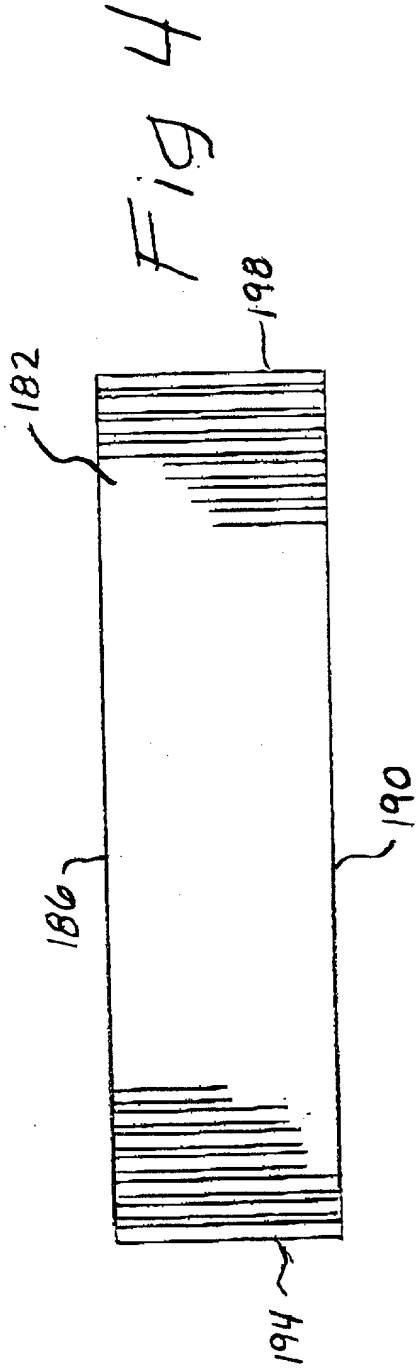


Fig 2c



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	<b>First Named Inventor</b>	HOWARD R. JOHNSON
	<b>COMPLETE IF KNOWN</b>	
	<b>Application Number</b>	
	<b>Filing Date</b>	Filed herewith
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My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

AIRCRAFT IGNITION CABLE CONNECTOR

the specification of which  
☒ is attached hereto  
OR  
☐ was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International

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I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
None			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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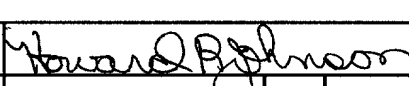
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Natan Epstein	28,997	Todd B. Serota	31,421
Robert Jacobs	33,403		

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Name of Sole or First Inventor:	<input type="checkbox"/> A petition has been filed for this unsigned inventor						
Given Name (first and middle [if any])			Family Name or Surname				
HOWARD R.			JOHNSON				
Inventor's Signature					Date	8-24-00	
Residence: City	El Segundo	State	CA	Country	U.S.A.	Citizenship	U.S.A.
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